Aalto University
School of Business

Do exchange traded funds outperform mutual funds?

A comparison of passive and active funds investing in European equity

Bachelor's Thesis
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Summer 2020

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Abstract of bachelor's thesis

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Title of thesis Do exchange traded funds outperform mutual funds?

Degree Bachelor's

Degree programme Finance

Thesis advisor(s) Michael Ungeheuer

Year of approval 2020 **Number of pages** 24 **Language** English

Abstract

In this paper I use data of actively managed open-end mutual funds and passive exchange traded funds that are categorized as European equity funds by Morningstar to compare the performance between the two. I find that when looking at gross returns, mutual funds investing in large capital underperform their benchmarks and those investing in small to medium capital overperform. ETFs on average do not generate statistically significant 4-factor alphas when using gross returns. Using net returns causes all categories to underperform their 4-factor benchmarks. After fees large capital ETFs outperform their mutual fund counterparts and small/medium capital ETFs are slightly beaten by the active mutual funds. I also find evidence of larger funds performing better than smaller funds in all categories. Best performance overall is with the Large equity investing ETFs.

Keywords Fund performance, Exchange traded funds, Mutual funds

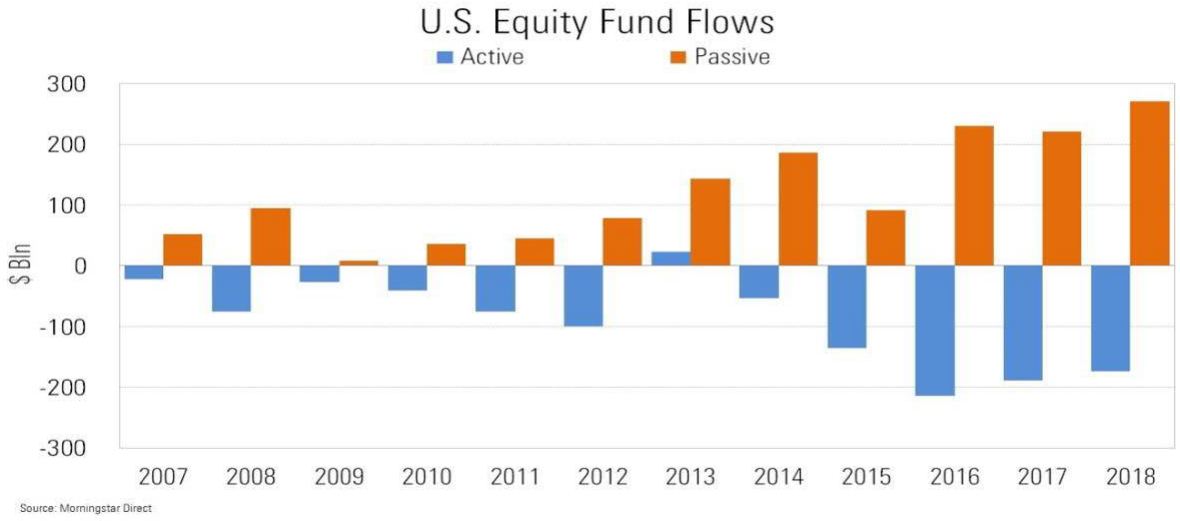
Contents

1. Introduction

The global Exchange Traded Fund market has grown over 5 trillion U.S dollars in ten years from 1 041 billion in 2009 to 6 181 billion in 2019. With an average annual growth rate of 25% (2009-2019) the Bank of America estimates the market to reach 50 trillion U.S dollars by 2030, making ETFs a large player in the financial markets of the next decade. In comparison, U.S based mutual funds account for 21.29 trillion U.S dollars of net assets in 2019. The European ETF market has grown up to 760 (€ bn) in March 2020, which accounts for 8.6% of all assets under management in European investment funds. By the year 2025 ETFs could make up to 25% of the European fund market according to Morningstar.

The first ETFs entered the market in 1993 and were fairly unpopular among investors in the beginning. Yet now there are 6970 ETFs (in 2019) globally and the amount has tripled in the past ten years from 1968 ETFs in 2009. The amount of mutual funds has grown less drastically from 83 thousand (2009) to 123 thousand (2019). However, in 2019, for the first time in history, assets of U.S equity index funds are higher than the assets of actively managed equity funds according to Bloomberg. This is the consequence of years of poor performance and investors realizing that active management was unable to save them from the 2008 financial crisis. Therefore, investor preferences have shifted more towards passive investing as seen in graph 1. Ever since 2007 the trend has been positive fund flows to passive investing and negative flows towards active funds.

Graph 1. Fund flows to passive and active U.S equity funds during 2007-2018[1]



[1)]Source: Morningstar report “A Look at the Road to Asset Parity Between Passive and Active U.S. Funds” https://www.morningstar.com/insights/2019/06/12/asset-parity

The popularity of ETFs arises from their low fees, high liquidity, transparency, diversification and tax-benefits, that make them a relatively safe passive investment available for everyone. The key differences between ETFs and mutual funds is the management and trading style. ETFs are mostly passive and directly follow a specific index resulting in minimal management fees, active mutual funds are managed actively to try and stock pick and benefit from arbitrage to beat the market, which requires a lot of resources and in return results in higher management fees. ETFs are traded like any other stock in the market and are thus accessible for everyone, unlike mutual funds that often have minimum investment requirements. This also means that ETFs can be shorted making index shorting more available for a larger audience than ever before. Mutual funds are traded between the fund and the investor and the price is updated at the end of each business day.

Traditionally the first ETFs followed the S&P 500 index, but as time went on, new types of ETFs were created following all sorts of indexes. Now ETFs are available in fixed income, commodities, money markets as well as specific equity capital sizes and industries. Due to the large range of ETFs investors are presented with passive investing opportunities available in all categories. This increased availability of passive investing has increased competition and pressure to generate higher returns for active mutual funds.

With the recent passive investing "boom" the purpose of this paper is to answer the question: "Do passive ETFs outperform active mutual funds in Europe?". The fund flows of the past years imply that the financial markets seem to believe that they do, and my main hypothesis is in line with this belief. But because finance is a science not based on beliefs, I study the reality of this debate with an empirical study. In this paper I focus on funds investing in European equity to see how passive ETFs perform when compared to actively managed open-end funds investing in the same category. I measure fund performance by using the Carhart (1995) 4-factor model with both gross and net returns. I also compare similar sized ETFs and mutual funds to find the fund categories with the best performance.

Using gross returns, I find that on average ETFs investing in large equity generate higher alphas but lower annual returns than mutual funds investing in large capital. Funds investing in small to medium equity generate higher alphas and higher returns than ETFs in small to medium equity. Using net returns the higher net expense ratios of mutual funds cause large equity funds to underperform ETFs in returns and generate significantly negative alphas. Small to medium equity investing mutual funds and ETFs perform very similarly even after expenses with

the mutual funds having slightly higher annual returns and alphas on average. I discover evidence of funds with larger total net assets generating higher returns than smaller funds, with the differences being quite large especially in the small to medium equity category.

I then create both value-weighted and equal-weighted portfolios from the funds to further look at performance and validate my results. Especially the value-weighted portfolio gives comparable results with the worse performing smaller funds having little significance in the results. I calculate the Sharpe-ratios of these portfolios to get another measure for risk-adjusted performance. The results show that the portfolios made of mutual funds investing in medium to small equity generate the highest returns and Sharpe-ratios.

2.Literature review

The argument between passive and active investing has been around since the first passive investment instrument was launched in 1976 by Vanguard in the form of an index mutual fund. Financial literature has ever since been trying to solve the superior management style, with results showing mixed results. Eric H. Sorensen (1997) studies manager skill and shows that only 11% of funds outperform the S%P 500 index in 1997, but states that it is likely that active management is superior in bear markets and passive in bull markets.

Market efficiency has often been connected in the debate between management styles. Burton G. Malkiel (2003) argues for passive investing superiority across all markets and segments even when markets are inefficient. His results show 69% of European funds underperform the MSCI-Europe index and 71% of US funds underperform the S&P 500 index in a ten-year time period ending in 2001. Malkiel asserts that in efficient markets the cost of finding anomalies is too high compared to the benefits that could be achieved. He also states that even when markets are inefficient passive investment performs better than active due to the zero-sum game and expenses. However, Malkiel finds that small equity investing funds actually outperform their index benchmark in some cases.

The higher expenses of active management are often used as an argument against the management style. Kenneth R. French (2008) asserts that the return on a passive investment portfolio is the gross market return minus the cost of passive investing. And an investor gains the difference between the value-weighted average cost of all investors and the cost of passive investing when shifting to passive investing. French shows that the typical investor would benefit from 67 basis points higher average annual returns from switching to a passive market portfolio

between 1980-2006. French argues that active investment is a negative zero-sum game after fees. Active investors with positive alphas are “dollar for dollar” at the expense of other active investors and thus active investing is a zero-sum game before fees, similar to passive investing. But because of the higher fees of active management the returns are lower.

A more recent study by Prodzinski and Miller (2018) compares active vs passive performance in the years 2009-2017. They use Sharpe ratios to account for risk-adjusted weekly returns of funds and conduct 9 statistical tests with the results not finding a significant difference between the Sharpe ratios of passively managed and actively managed funds. However, the Sharpe ratio by itself is a slightly problematic measure, as it fails when returns are not normally distributed and when funds are illiquid.

Fund performance is a widely researched area in financial literature with a number of models available to measure performance. In this paper I use the 4-factor model introduced by Carhart (1995) to measure performance. Carhart adds the momentum factor introduced by Jegadeesh and Titman (1993) to the 3-Factor model by Fama and French (1993) for better accuracy in results. Carhart (1997) finds that portfolio turnover reduces returns by 95 basis points per transaction and that net expense ratios are negatively correlated with returns almost “one to one”. Carhart states that most funds underperform by about the amount of their investment expenses and the bottom decile funds underperform by twice their investment expenses, these funds are however always the smallest and thus have little significance.

Fama and French (2008) look at mutual fund performance from the equilibrium accounting perspective and find that mutual funds create a portfolio close to the market portfolio and the returns generated are very close to market returns before fees and expenses, but the fees of active management result in lower returns.

I lean on the work by Ferreira et al (2013) where the 4-factor model is used to study mutual fund performance cross-country internationally, while I focus on Europe. Ferreira et al (2013) assert that internationally equity mutual funds underperform on average by 20 basis points per quarter after fees. They find that unlike US funds, non-US funds (and funds investing internationally) are not negatively affected by growing size. They also experiment with a number of other fund characteristics to see which are correlated with returns.

I use my sample of ETFs to represent passive investing and open-end mutual funds for active investing to create a fresh, more modern look for the old debate. With the rise of ETFs, we are presented with a larger and more diverse sample of passive investing than ever before,

especially in the Europe area. This is why my research can shed new light on the topic, especially with my recent sample period of 2010-2020.

3. Data and methodology

3.1 Sample Description

My data of ETFs and mutual funds comes from the Morningstar direct database. The data is mostly survivorship bias free as the database tries to keep inactive funds, however there is a possibility of slight survivorship bias amongst the smallest funds, as not all the data I require was available for the inactive funds. I select all ETFs categorized by Morningstar as Europe large capital, Europe small/medium capital as well as Eurozone large- and small/medium capital. Open-end Mutual funds were picked in the same Morningstar categories as the ETFs with the additional condition of no index funds. Since Morningstar has multiple data sets of the same fund, due to share classes, I choose the most relevant share class and then remove all duplicates of the same fund from the sample to make sure they don't have an effect on returns.

I require that fund size (TNA), net expense ratio and monthly returns (both net and gross) are available for all funds. I require returns of at least 5 years to more accurately have the results represent this decade and to lower the impact of the newest funds. I exclude all funds with assets under 10€ million for they have little significance in reality and since small funds perform the worst, they would cause a bias in my results. I am left with 111 ETFs and 566 open-end actively managed mutual funds. Table 1 shows the number of funds in each equity and size category and the average total net assets under management in 2020. Fund size is defined by Morningstar as the total money managed as a standalone portfolio across share classes/subaccounts. My sample ETFs have a total TNA of 95€ trillion and the mutual funds 170€ trillion. I divide the mutual funds into size categories to match the sizes of the ETFs to make results more comparable.

Table 1. Fund Universe and TNA under management

This table presents the number of funds in each category and the average TNA under management for each category as well as the standard deviation of TNA. ETFs have been divided

into five percentiles and then the mutual funds have been divided into five groups to match funds of similar size.

		Fund Size Quantile				
	Total	1	2	3	4	5
			Panel A: ETF			
			Equity Large			
Number of funds	90	18	18	18	18	18
TNA (€ Millions)	1001	36	137	280	820	3730
St.dev	1908	23	24	80	346	2947
			Equity Medium/Small			
Number of funds	21	5	4	4	4	4
TNA (€ Millions)	276	14	46	135	345	908
St.dev	367	10	15	40	47	380
			All ETFs			
Number of funds	111	23	22	22	22	22
TNA (€ Millions)	864	27	118	252	659	3301
St.dev	1747	16	30	72	263	2811
			Panel B: Active Mutual Funds			
			Equity Large			
Number of funds	383	121	78	104	58	22
TNA (€ Millions)	333	31	104	284	733	1979
St.dev	541	13	23	90	200	1079
			Equity Medium/Small			
Number of funds	183	37	36	49	36	25
TNA (€ Millions)	237	17	55	122	281	987
St.dev	364	10	12	29	87	500
			All MFs			
Number of funds	566	158	114	153	94	47
TNA (€ Millions)	302	27	83	208	551	1566
St.dev	493	12	20	67	139	871

3.2 Measuring fund performance

I estimate fund risk-adjusted performance using the Carhart (1997) 4-factor model. It improves on the Fama and French (1992) 3-factor model by adding a momentum factor to account for the momentum anomaly introduced by Jegadeesh and Titman (1993). The regression is calculated by:

$$R_{it} = \alpha_i + \beta_{0i}RM_t + \beta_{1i}SMB_t + \beta_{2i}HML_t + \beta_{3i}MOM_t + \varepsilon_{it}$$

Where R_{it} is the return of fund i in excess of the risk-free rate in month t; RM_t is the excess return of the market in month t. SMB_t (small minus big) is the average return of the small capitalization portfolio minus the large capitalization portfolio in month t, used to capture the size anomaly. HML (high minus low) is the return of a high book-to-value minus the minus the return of a low book-to-value portfolio in month t, used to capture the value anomaly. MOM is the difference in return between the past year's winners and losers' portfolios in month t, used to capture the momentum anomaly. The alpha represents abnormal returns, that cannot be accounted for with the factors.

I use both net and gross returns from the time period between January 2010 to April 2020, as April was the last month with all factors available at the time of writing this paper. This results in 124 months of returns. The net and gross regressions generated results with insignificant differences between the factor loadings.

Table 2 presents the average monthly returns of the factors between 2010-2020 as benchmarks for the model. All monthly returns are from the Kenneth. R. French data library and I use the European values. During this time period the market premium has been the highest on average (0,39%) with the average momentum return being fairly close (0,35%). The average value return is negative (-0,39%) and the smallest of the group. Average size return is fairly small (0,16%) during the period. The most important factors for my sample are the market and the size factors, since those will account for most returns in my sample of size investing funds.

Table 2. Summary statistics for monthly returns of the 4-factor model

Shows the mean of monthly returns of the four factors between the years 2010-2020. RM is the excess market return, SMB is the excess return form the portfolio of small-cap companies over large-cap companies, HML is the excess return of high book-value companies over low book-value companies. MOM is the excess return of past winners over past losers.

	Monthly mean 2010-2020			
	RM	SMB	HML	MOM
Average return	0,39	0,16	-0,39	0,35
Standard Deviation	4,96	1,72	2,46	3,30
T-stat	0,88	1,01	-1,74	1,17

My null hypothesis for the four-factor tests is that the expected values of the 4-factor alpha are zero for the funds in my sample, because the factors account for returns. The alternative hypothesis is that some funds have private information and thus their expected alphas are positive or negative, depending on the value of the information. Abnormal returns are represented by the alpha in the model. A positive alpha suggests overperformance when compared to the benchmark. In turn, a negative alpha indicates underperformance.

Table 3 represents the average factor loadings of ETFs in panel A and mutual funds in panel B and the R^2 statistics of the regressions. The market betas of the funds are all close to 1.0 as my fund sample consists of only funds investing in European equity. Highest average market beta is in the ETFs investing in small and medium equity with 1,10. It seems the large equity ETFs load more into large equity (average factor of -0,23) than the equivalent mutual funds (average factor of -0,05). Mutual funds investing in small and medium equity load more into small equity (average factor of 0,65) than the ETFs (average factor of 0,39). The value factor loadings range from to 0,0-0,1 in almost all categories, except the small/medium mutual funds that have a mean of -0,12. The momentum loadings are all close to 0,0. These loadings being close to 0,0 is expected as my fund universe consists of funds not strategizing in the value or momentum anomalies.

The R^2 statistics of all ETFs and mutual funds are high at 93% and 92%, as they should be to assure that the model works as intended with European data. Yet they are not too high to cause concern in the results either. The lowest R^2 in the regression is for the small/medium capital investing mutual funds, which indicates that they have the highest unexplainable variance in returns.

Table 3. Fund factor loadings and R-squared

This table shows the means of monthly factor loadings and their R^2 statistics that are calculated from the 4-factor model. Factor definitions are the same as described previously. R-squared (R^2) shows how much of the funds return behavior can be explained by the behavior of the benchmark factors. It is calculated here by dividing unexplained variation of returns by total variation. The numbers on column 2 represent each size category of funds.

		RM	SMB	HML	MOM	R^2
Panel A: ETF						
All		1,03	-0,11	0,07	-0,02	0,93
Equity Large		1,01	-0,23	0,09	-0,02	0,94
	1	1,01	-0,26	0,00	-0,02	0,94
	2	1,02	-0,26	0,06	-0,02	0,94
	3	0,99	-0,15	0,05	-0,02	0,94
	4	1,03	-0,22	0,18	-0,02	0,93
	5	1,02	-0,25	0,14	-0,02	0,95
Equity Med/ Small		1,10	0,39	-0,04	-0,03	0,92
	1	1,12	0,50	-0,17	0,02	0,92
	2	1,12	0,31	0,01	0,01	0,97
	3	0,72	0,28	0,05	-0,23	0,94
	4	1,05	0,47	-0,01	-0,06	0,96
	5	0,90	0,37	-0,06	-0,09	0,96
Panel B: Mutual funds						
All		1,04	0,18	-0,05	0,01	0,92
Equity large		1,04	-0,05	-0,01	0,01	0,95
	1	1,03	-0,06	-0,13	0,01	0,95
	2	1,04	-0,04	-0,05	0,02	0,95
	3	1,05	-0,04	0,03	0,00	0,95
	4	1,05	-0,05	-0,02	0,01	0,96
	5	1,03	-0,06	0,00	0,01	0,93
Equity Med/ Small		1,06	0,65	-0,12	0,00	0,87
	1	1,09	0,65	-0,26	0,02	0,89
	2	1,09	0,66	-0,09	0,02	0,90
	3	1,07	0,73	-0,12	0,00	0,89
	4	1,04	0,61	-0,09	-0,01	0,85
	5	0,96	0,57	0,03	-0,02	0,82

4. Empirical Results

4.1 Gross results

Table 4 represents the results of the four-factor model when using gross returns. When looking at all funds in each investing category, the ETFs generate alphas insignificant from zero and the average annual returns are higher for the small/medium equity ETFs with 5,59%, while large equity investing ETFs generate the lowest annual returns of the sample with 3,88%. The large equity investing mutual funds generate a negative and significant alpha even when using gross returns, indicating underperformance and that there is no private information with funds in this category. The small/medium equity investing mutual funds have the highest alpha of the group, as well as the highest returns. The higher returns are unsurprising since during my sample period the

SMB factor has had positive returns indicating that small equity has been overperforming large equity.

Index funds have a tracking error relative to the benchmarks they follow, that can cause very slight under or overperformance of the funds when compared to the index they try to represent. The error Is a result of fund managers failing at recreating the benchmark, and this can have an effect on the ETFs alphas in the model when we look at gross returns. The average tracking error amongst European equity ETFs was only 0,06% weekly according to Morningstar and thus the effects should be minimal.

Table 4. Gross Yearly Alphas and Annual Excess Returns

This table shows the results of the four-factor model. Alphas are a measure of risk-adjusted performance and they are shown in yearly percentual form (monthly alpha * 12). T-statistics are given to indicate alpha significance from the value zero and annual returns are the mean of monthly returns during the time period annualized. Numbers in row 1 indicate size groups.

	All	5	4	3	2	1
			ETF			
Equity Large						
12 * a	0,028	0,281	0,040	-0,199	0,129	-0,109
t(a)	0,24	2,04	0,39	-1,32	1,24	-1,19
Annual returns	3,88 %	4,47 %	3,99 %	3,86 %	3,60 %	3,48 %
Equity Med/ Small						
12 * a	-0,222	1,546	0,098	-1,092	-0,558	-0,926
t(a)	-1,44	18,43	1,94	-5,57	-3,44	-5,82
Annual returns	5,59 %	8,55 %	5,92 %	3,28 %	5,45 %	4,95 %
			Mutual funds			
Equity Large						
12 * a	-0,492	0,698	0,051	-0,377	-0,720	-0,913
t(a)	-4,30	6,77	0,49	-3,72	-7,74	-7,41
Annual returns	4,36 %	6,01 %	5,15 %	4,33 %	4,24 %	3,78 %
Equity Med/ Small						
12 * a	1,530	2,842	1,930	1,343	1,017	0,118
t(a)	7,15	13,64	10,38	7,10	4,65	0,55
Annual returns	8,29 %	10,50 %	8,76 %	8,35 %	7,44 %	5,45 %

The Best performing funds in all categories are the largest, both in highest alphas and average annual returns. All small/med equity investing mutual funds generate positive alphas,

with size group 5 being the best performing of all. There are several explanations given for larger funds overperforming smaller funds in past financial literature. For example, the capability to spread expenses across a larger asset base and higher resources to spend on research are mentioned by Ferreira et al (2013). In addition, larger funds are able to reach bigger transaction sizes at greater volumes and negotiate better spreads on deals.

Past studies have been inconclusive on whether fund size and returns are indeed positively or negatively correlated. However, Ferreira et al (2013) find that with non-US based funds, or internationally investing funds the relation is positively correlated. As my fund sample is built of non-US based funds and international funds, I too find a positive correlation. Ferreira et al find a negative correlation in US funds between size and returns. Reasons given for the negative correlation by Ferreira et al in US funds are related to liquidity constraints. Funds outside of the US are more liquid and also much smaller and have not yet reached the diseconomies of scale that the largest US funds have, as stated by Ferreira.

Before we look at the net returns and how the expenses effect the regression results, it is important to highlight that even though the large equity ETFs have better alphas than the mutual funds and better risk-adjusted performance, the returns are higher for the mutual funds. As the factor loadings in table 3 indicate the mutual funds have slightly higher market and size factor loadings that can partly explain these higher returns, even though the abnormal returns are non-existent for all but the largest mutual funds.

4.2 Expenses and fees

Next I look at the net expense ratios and management fees of the funds that are presented in table 5. Morningstar defines management fees as the most recently reported actual percentage that was deducted from an investments average net asset to pay for the investment's management, and net expense ratios as the percentage of fund assets used to pay for operating expenses and management fees. The funds with the lowest expenses are the large capital investing ETFs with an expense ratio mean of only 0,32% and management fee mean of 0,30%. Small/medium capital investing ETFs have slightly higher expenses at an expense ratio mean of 0,38 and management fee mean of 0,36. All ETFs have a mean expense ratio of 0,33% and a management fee of 0,31%, leaving the average operating expenses at only 0,02%.

As expected, the mutual funds have significantly larger expenses than the ETFs. All mutual fund mean net expense ratios are at 1,79% and management fees of 1,34%, thus average operating expenses are very high at 0,45% when compared to the ETFs. In addition to ETFs having significantly smaller average expense ratios, funds investing in small/medium equity have larger expenses than the funds investing in large capital equity. This indicates that loading into a positive SMB factor is a more expensive investing strategy, perhaps due to small capital equity being more illiquid than large.

Table 5. Net expense ratios and management fees of funds.
This table shows the average net expense ratios and average management fees categorized by fund investment strategy and size. Management fee is the most recent actual percentage that was deducted from an investments average net asset to pay for the investment's management, and net expense ratios as the percentage of fund assets used to pay for operating expenses and management fees. Values are in percentages.

			Fund Size Group			
	Total	1	2	3	4	5
			Panel A: ETF			
			Equity Large			
Net expense ratio	0,32	0,33	0,38	0,34	0,33	0,22
Management fee	0,30	0,33	0,36	0,30	0,32	0,20
			Equity Medium/Small			
Net expense ratio	0,38	0,30	0,36	0,44	0,30	0,46
Management fee	0,36	0,26	0,33	0,44	0,30	0,43
			All			
Net expense ratio	0,33	0,34	0,39	0,34	0,33	0,26
Management fee	0,31	0,32	0,36	0,32	0,31	0,24
			Panel B: Mutual Funds			
			Equity Large			
Net expense ratio	1,67	1,93	1,59	1,53	1,52	1,51
Management fee	1,26	1,40	1,18	1,22	1,13	1,25
			Equity Medium/Small			
Net expense ratio	2,06	2,78	2,08	1,85	1,94	1,57
Management fee	1,51	1,61	1,59	1,43	1,57	1,31
			All			
Net expense ratio	1,79	2,15	1,82	1,65	1,47	1,65
Management fee	1,34	1,45	1,36	1,33	1,16	1,30

Table 5 also shows that size and expense ratios are negatively correlated with a few exceptions to the rule. Large capital investing ETFs and mutual funds both have decreasing management fees and net expense ratios as fund size grows, which gives one explanation to why larger funds have higher returns. However, in small to medium equity ETFs the correlation seems to be positive. Surprisingly, the largest small/medium ETFs group has the highest average expense ratio of the group (0,46%) and the highest average alpha and returns. These ETFs have relatively high management fees when compared to other ETFs, which can be the result of their overperformance, leaving investors willing to pay slightly more for the fund.

Mutual funds have decreasing average expense ratios as size grows, regardless of their investing strategies. The mean net expense ratios of large equity mutual funds are close to each other in each category with the exception of the smallest funds, that are also the worst performing funds on average. Regardless of the similar expenses the higher the funds' assets, the better their performance. This would suggest that the expense ratios in this category do not have a large effect on the fund's overall performance.

The best performing funds have the lowest management fees, which suggests that instead of more skilled managers generating better performance and thus requiring more salary, managers that get payed less have funds with higher returns as their fees are lower and have less of an effect on performance. As the funds increase in size the difference between management fees and expense ratios decreases. This means that on average the operating expenses of funds are smaller for funds with larger TNA. These lower operating expenses can explain the larger funds outperforming smaller funds.

The mean management fees and net expense ratios of ETFs are very close to each other, which is unsurprising since trading passively and following an index requires minimal resources and trading costs are small. Active management on the other hand requires extensive research and high frequency trading which results in higher costs.

In addition to other expenses, ETFs also have a cost to the investor known as the bid-ask spread. The investor pays the asking price when buying and sells at the bid price when selling. The difference between the two decreases the potential returns received especially on lower-liquidity ETFs. This spread along with the tracking error can cause the net returns to be lower than expected when compared to just the expense ratios.

4.3 Net results

Next I use the 4-factor model with the net monthly returns from Morningstar direct. Net returns are more important for investors as they represent the actual returns that can be achieved from the investment. Net results give the best insight on realistic performance when comparing the funds. Table 6 shows the alpha results of the regression as well as the average annualized monthly returns during the period. When compared to the gross results, both large and small/medium investing ETFs generate on average negative and significant alphas. The large capital ETFs average alphas decreased from 0,028 to -0,302, while the average annual returns fell slightly from 3,88% to 3,55%. Small/medium capital ETFs average alphas decrease from -0,222 to -0,608 and the average annual returns fall from 5,59% to 5,21%, which is a slightly higher decrease than in the large capital investing ETFs. Before looking at different sized funds, all investing categories now average a negative alpha.

Mutual fund alphas are affected more by the change to net returns, as their expense ratios are on average higher. The large capital investing mutual funds underperform the ETFs by a significant amount in average alphas and annualized average returns. The average annualized alphas decrease from -0,492 to –2.124 and the average annualized returns from 4,36% to 2,74%. The average alpha is 1,822 less than that of the ETF counterparts, indicating that in large capital investing funds, active management does not add value as funds underperform the market and passive funds. Large equity mutual fund returns are also on average lower than the ETFs with a difference of 0,81% annually.

The small/medium capital equity investing mutual funds average alphas decrease more than the large capital funds from a positive 1,530 to a negative and significant -0,551. The average annual returns also decrease more than the large mutual funds to 6,19%, as expected with their higher average net expense ratios. The correlation with size and average alphas remains mostly unchanged from the gross results. However smaller funds underperform relatively more in the net results as their larger expenses take a larger toll on the returns, with the exception of small/medium ETFs.

Table 6. Net Yearly Alphas and Excess Returns

Table shows the annualized intercepts from the regression (12 * a) as well as the t-statistics of the intercepts (t(a)) for the regression. The annual returns are the annualized average monthly returns during the period.

	All	5	4	3	2	1
				ETF		
Equity Large						
12 * a	-0,302	-0,002	-0,288	-0,517	-0,259	-0,446
t(a)	-2,65	-0,01	-2,84	-3,51	-2,63	-5,13
Annual returns	3,55 %	4,18 %	3,66 %	3,54 %	3,22 %	3,14 %
Equity Med/ Small						
12 * a	-0,608	1,061	-0,200	-1,529	-0,943	-1,265
t(a)	-3,94	12,47	-3,64	-7,63	-5,59	-8,18
Annual returns	5,21 %	8,07 %	5,62 %	2,84 %	5,06 %	4,61 %
				Mutual funds		
Equity Large						
12 * a	-2,124	-0,901	-1,373	-1,930	-2,252	-2,780
t(a)	-16,36	-9,59	-12,36	-18,71	-22,55	-18,62
Annual returns	2,74 %	4,48 %	3,73 %	2,77 %	2,70 %	1,96 %
Equity Med/ Small						
12 * a	-0,551	1,153	-0,107	-0,581	-1,307	-2,563
t(a)	-2,47	5,27	-0,62	-3,06	-6,03	-12,70
Annual returns	6,19 %	8,80 %	6,71 %	6,41 %	5,09 %	2,75 %

The best risk-adjusted performing funds as a category are now the large ETFs with their alphas being the closest to zero. The largest small/med equity mutual funds of size category 5 have the best risk-adjusted performance with the highest alpha of 1,153 and annual returns of 8,80%. The small/medium equity mutual funds also have the highest average returns during the period, even though the average alpha is less than the large ETFs. This is explained with higher market and size factor betas that generate the higher returns.

Large capital investing mutual funds are the worst performing group. All funds generate negative and significant alphas. Especially the smallest funds in size groups 1 and 2 underperform, together with the smallest mutual funds from the small/medium investing category, they have the smallest alphas in the sample and the lowest returns. Active management has more of a negative effect on the smallest funds and the differences between the performance of the largest and smallest funds are larger in the mutual funds when compared to the ETFs.

4.4 Equal and value-weighted portfolios

To get an even more comprehensive understanding of fund performance I create equal and value weighted portfolios of the funds with both gross and net returns. I perform the same 4-factor regression as above with the addition of calculating the Sharpe ratio (1966) of each portfolio to further look at risk-adjusted performance. The Sharpe ratio is a measure for risk-adjusted performance, and it is calculated by the average excess return per unit of volatility introduced by William F. Sharpe (1966).

Equal weighted portfolios are useful for looking at the different type of funds' performance as a group, as funds of all sizes are valued with the same weight. Value-weighted portfolios take into account the size of funds and give a higher weight to the largest funds which in turn increase the performance of the portfolios as in my sample these are the best performing funds.

These portfolios enable an overall look at the different funds factor loadings and performance. As seen in table 7, the best performing portfolios are the value-weighted med/small mutual fund and ETF portfolios with positive alphas of 0,559 (ETF) and 0,898 (MF) and the highest average returns 7,06% (ETF) and 8,43% (MF). The worst performing is the equal-weighted large mutual fund portfolio with the lowest alpha and average returns. With net returns the large ETF portfolios overperform the comparable mutual fund portfolios, while the small/medium ETF portfolios underperform their counterparts.

The higher returns of the small/medium mutual fund portfolios can be mostly accounted for by their factor loadings. The market betas are slightly lower than those of the ETFs but the higher size factor loading with the value factor loading being more negative cause the higher returns together with the abnormal returns in the value-weighted portfolio. The Sharpe ratios of the portfolios also indicates that the small/medium mutual funds have the best risk-adjusted performance.

Table 7. Regression factor loading and results for the portfolios

The first part of the table is calculated with net monthly returns and the lower with gross monthly returns. First column represents whether the portfolios is equal or value-weighted and strategy shows what category the funds are investing in each portfolio. The alpha is the annualized monthly intercept from the regression in percent. The factors are the same as discussed before

and Sharpe ratio is annualized (monthly Sharpe * SQRT(12)). Returns are given in annualized monthly returns during the period between 2010-2020.

				ETF				
Portfolio	Strategy	12 alpha	Rm-rf	SMB	HML	MOM	Sharpe	Return
EW	Large	-0,302	1,013	-0,227	0,086	-0,018	0,171	3,55 %
	Med/small	-0,608	1,104	0,396	-0,003	-0,028	0,247	5,21 %
VW	Large	-0,303	1,023	-0,241	0,022	-0,016	0,191	3,87 %
	Med/small	0,559	1,108	0,406	-0,114	0,003	0,349	7,06 %
				MF				
EW	Large	-2,124	1,038	-0,049	-0,012	0,008	0,127	2,74 %
	Med/small	-0,551	1,059	0,653	-0,116	0,005	0,314	6,19 %
VW	Large	-1,374	1,040	-0,046	-0,081	0,010	0,191	3,83 %
	Med/small	0,898	1,095	0,647	-0,241	0,018	0,434	8,43 %

				ETF				
EW	Large	0,028	1,013	-0,227	0,086	-0,018	0,191	3,88 %
	Med/small	-0,222	1,104	0,396	-0,003	-0,028	0,267	5,59 %
VW	Large	-0,039	1,023	-0,241	0,023	-0,016	0,206	4,14 %
	Med/small	0,995	1,108	0,406	-0,114	0,003	0,372	7,50 %
				MF				
EW	Large	-0,492	1,035	-0,053	-0,011	0,010	0,218	4,36 %
	Med/small	1,530	1,061	0,655	-0,116	0,005	0,429	8,29 %
VW	Large	0,182	1,038	-0,050	-0,079	0,012	0,278	5,37 %
	Med/small	2,652	1,097	0,648	-0,242	0,018	0,527	10,20 %

Especially comparing the gross and net results show the negative effects on performance of the higher expenses of the mutual funds on average. Before expenses the only mutual fund portfolio that underperforms the ETF portfolios, when looking at 4-factor alphas, is the equal-weighted large capital portfolio. The gross Sharpe ratios indicate that the mutual fund portfolios have higher risk-adjusted performance. Net results show the Sharpe ratios of the mutual funds remain higher than the ETFs in the small/medium portfolios and decrease below those of the large and actually are the same for the value-weighted large portfolios. Both intercepts and returns are however higher for the large ETFs indicating that in this category they have better performance.

4.5 Discussion of results and robustness checks

My findings are in line with past financial studies on the topic. I find similar results as Malkiel (2003), with small cap equity investing funds beating their benchmarks on average and larger equity investing funds underperforming. Otten and Bams (2002) also find similar results as I with positive correlation with size and negative with net expense ratios when looking at performance in European funds.

However, my sample of funds is quite small due to the limited availability of all the data I required (both net and gross returns and net expense ratios) especially with the ETFs. Therefore, the performance of small equity investing funds should be studied more in the future when more data is available for conclusive results. I also propose more extensive research on why small equity investing seems to be beneficial for active management and large equity for passive, as I cannot fully answer this question. A possible explanation is likely related to how small equity performs better on average, and thus it is easier for active management to overperform. In addition, with the more illiquid nature of small equity that can lead to easier arbitrage for the active funds.

My results show that performance is better for funds with larger TNA, which is similar to the non-US fund results of Ferreira et al (2013). I too find that the mutual funds potentially high returns are for the most part destroyed by their expenses as argued by French (2008) and Malkiel (2003). With all these similarities in results with past studies I am assured of the robustness of my study. However, I do conduct a few additional robustness checks to be certain.

Firstly, I check that the factor loadings from the 4-factor model are the same as presented in table 3 with both gross and net returns and the results had insignificant differences. I also use the value and equal weighted portfolios, gross and net, factor loadings here presented in table 7 as an additional check. I calculate the Sharpe ratios of the portfolios to have an additional measure to check the results of the model. The Sharpe-ratios validate my results for the most part, however the Sharpe ratio of illiquid funds can be too high and inaccurate which can be a factor when looking at the ratios of small equity investing funds in table 7.

Secondly, to account for the possible survivorship bias in the smallest funds I run the 4-factor model again without the smallest funds in group 1, as they are the most likely to suffer from the bias and are the worst performing. The results in table 8 show that the large cap mutual

funds remain the worst performing, while the best alpha is now with the small investing mutual funds. These results indicate that without the smallest worst performing funds alphas are close to zero for all but the large cap investing mutual funds.

Table 8. 4-factor results without smallest funds.

Alpha is annualized (monthly alpha * 12) and the factors the same as used before.

	MF		ETF	
	Large	Small/Medium	Large	Small/Medium
Alpha	-1,61	-0,21	-0,27	-0,40
RM	1,04	1,08	1,01	1,10
SMB	-0,05	0,66	-0,22	0,41
HML	-0,05	-0,14	0,07	0,00
MOM	0,01	0,01	-0,02	-0,03
R^2	0,95	0,88	0,93	0,92

5. Conclusion

This study looks at the performance of 111 passive ETFs and 566 active mutual funds investing in European equity during the period of 2010-2020. I find that using gross returns ETFs generate 4-factor alphas that are insignificant from zero. Mutual funds investing in small/medium equity generate a positive and significant alpha while large equity investing funds generate a negative alpha. Larger funds perform better than smaller funds in all categories. The best performers are the largest small/med equity mutual funds with the highest alphas and returns.

Factor loadings of the regression show that on average the large equity mutual funds load the market and momentum factors more than the ETFs. The small/medium investing mutual funds load more positively into the size factor than their ETF counterparts and the large equity investing funds load less negatively into the SMB factor than the ETFs. The loadings into the value factor are more negative for the mutual funds.

In my sample size and expenses are mostly negatively correlated; the larger the fund the smaller the net expense ratios are. Surprisingly, the category with the largest average net expense ratios (small/med equity mutual funds) also performs the best. Active mutual funds have on average 1,46 percentile points higher net expense ratios than the ETFs. The expenses cause a

large decrease in performance when moving from gross results to net, especially for the active mutual funds.

Net results show that large equity investing ETFs are the best performing group of all and they outperform their mutual fund counterparts in risk-adjusted performance. The largest underperformers are the large equity investing mutual funds, especially the smallest of these funds underperform relative to their factor loadings and have abysmal average returns during the period. Before the smallest funds, performance is fairly similar between the ETFs and mutual funds in the smaller capital investing category with slightly better performance amongst the mutual funds. The value and equal-weighted portfolios confirm the previous results.

The debate between passive and active investment styles remains unsolved with my results indicating that the solution depends more on the investment strategy of the managed funds.

6. References

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